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PROTEIN CRYSTAL GROWTH IN MICROGRAVITY

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ABSTRACT

The overall scientific goals and rationale for growing protein crystals in microgravity will be discussed. Data on the growth of human serum albumin crystals which were produced during the First International Microgravity Laboratory (IML- 1) will be presented. Potential scientific advantages of the utilization of Space Station Freedom will be discussed.

PROTEIN CRYSTAL GROWTH

Space Station Utilization Conference

Daniel C. Carter

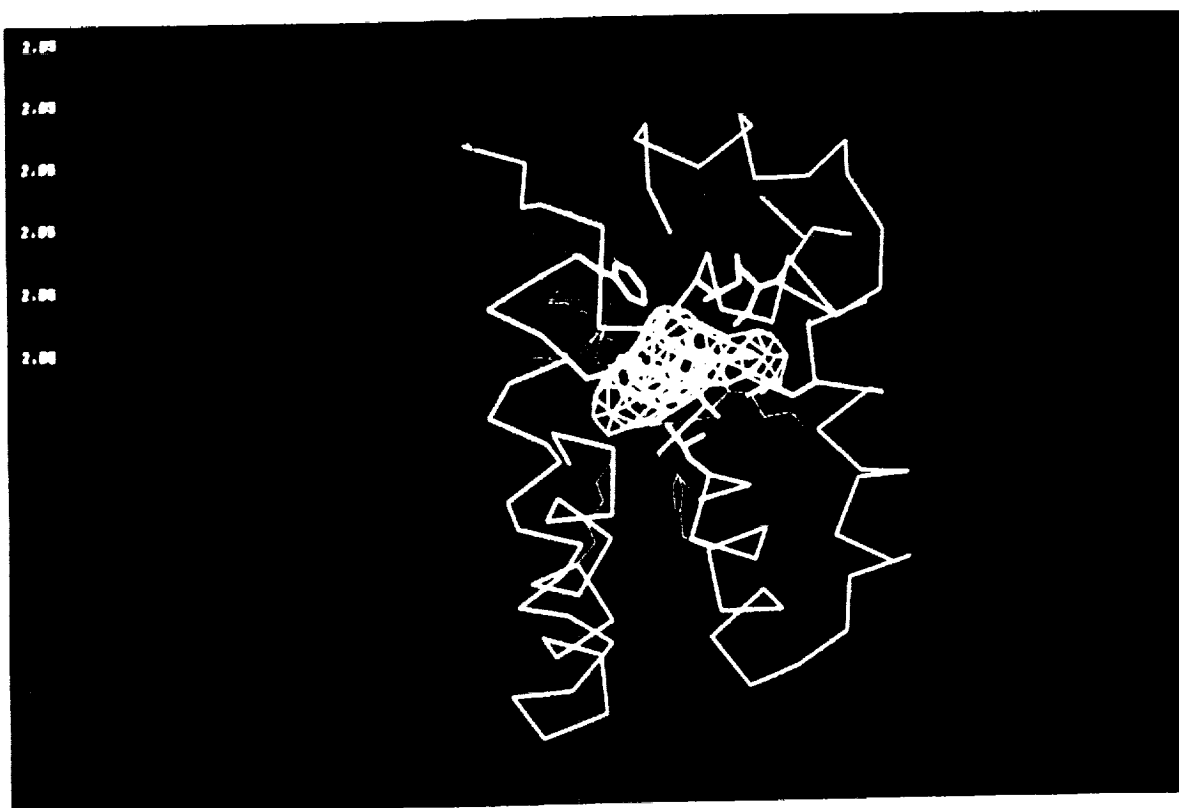
IMPORTANCE:

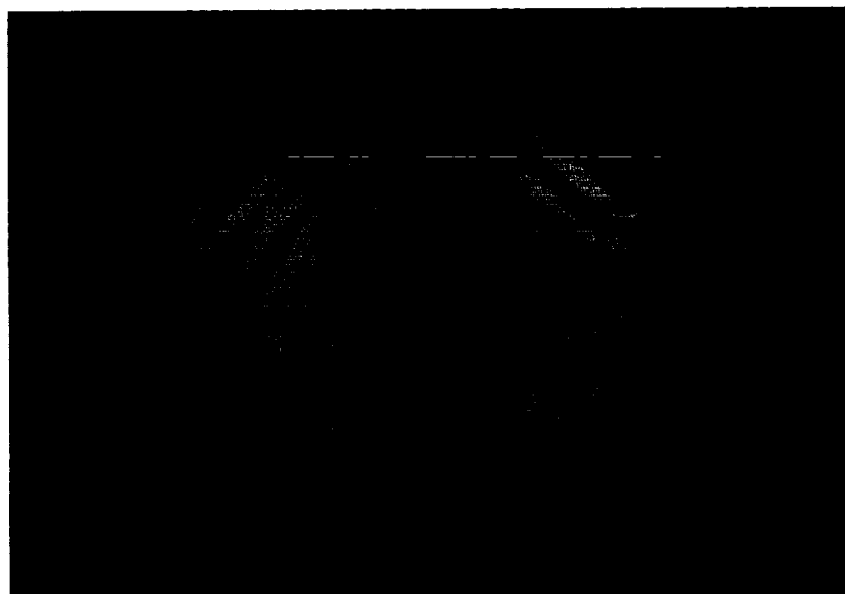
Scientific application of crystals

- a. Fundamental importance in molecular biology - understanding how enzymes function etc.
- b. Knowledge of accurate atomic structures of - proteins of key importance in rational drug design

Crystal properties and growth processes

- a. Understanding important influences on the growth of high quality protein crystals by using gravity as an experimental variable
- b. What properties of the crystals are different, e.g., resolution, defect structure, mosaicity





PROBLEM:

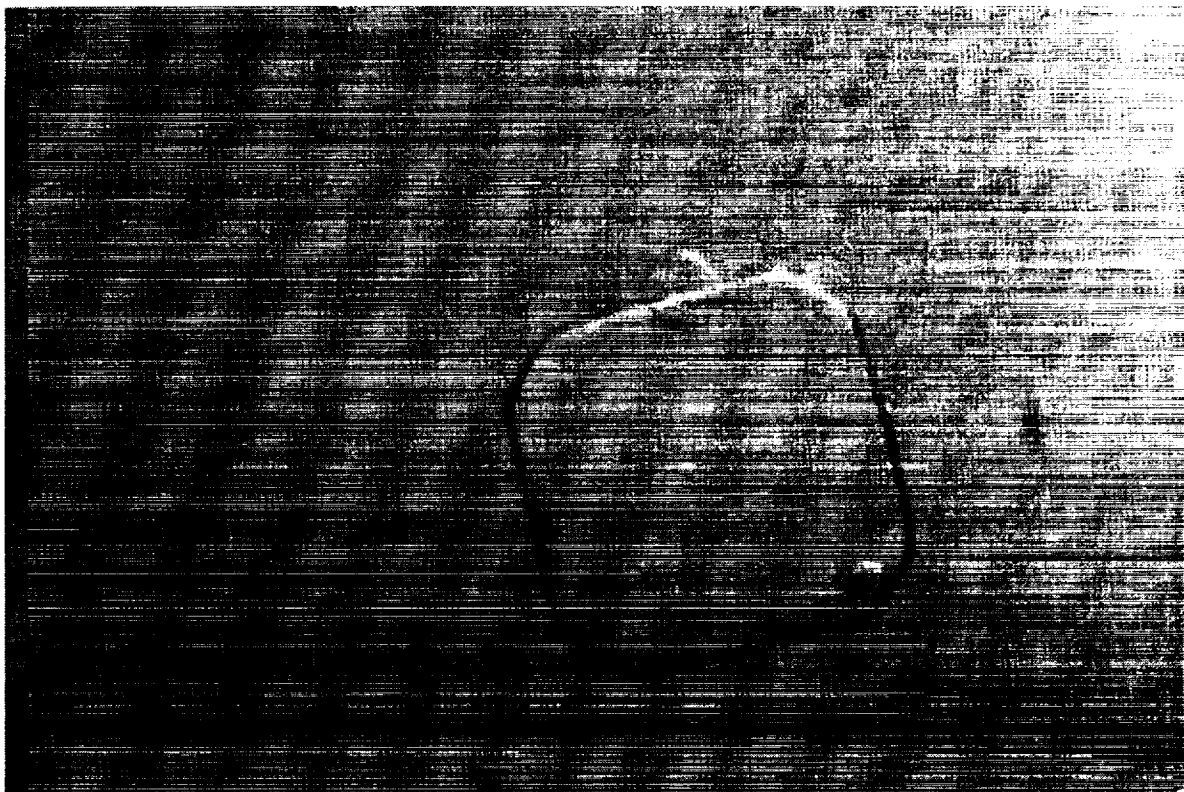
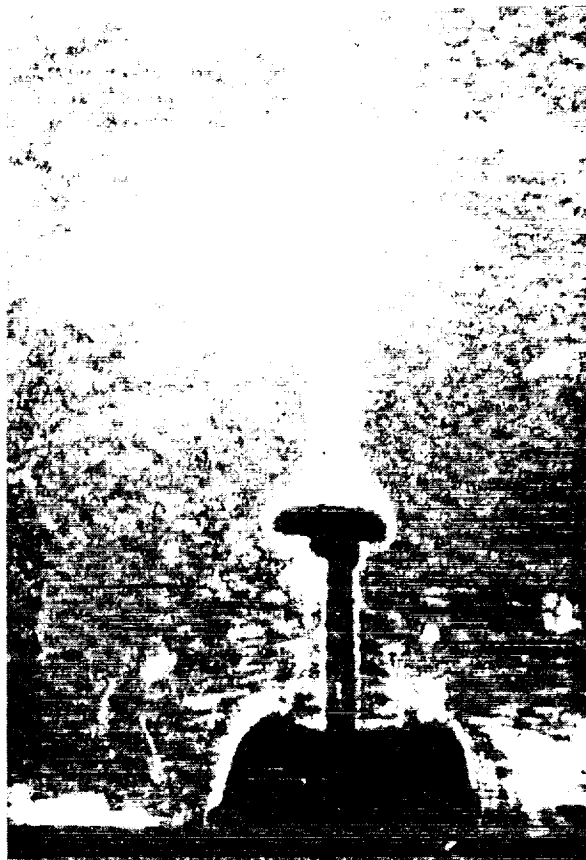
Growth of high quality protein crystals for application in atomic structure determination by x-ray and neutron diffraction

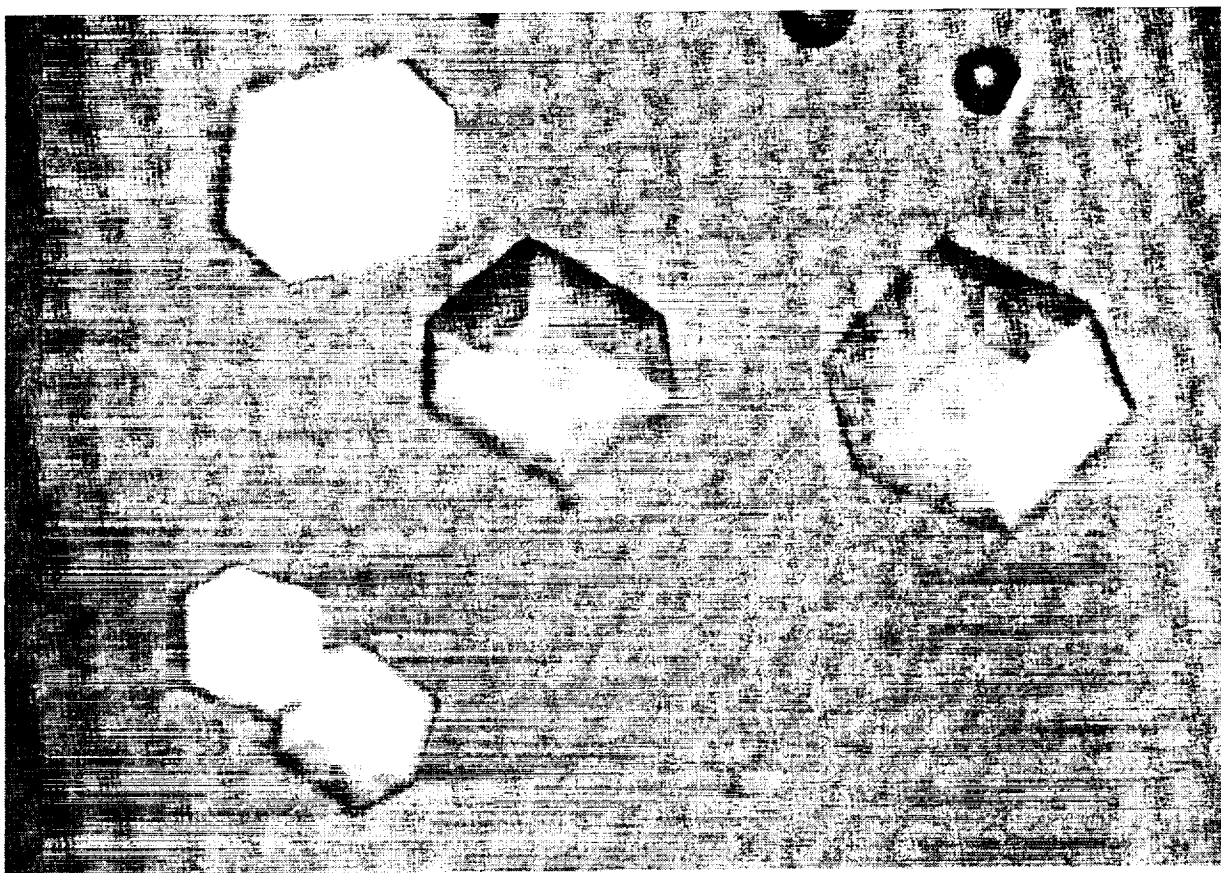
Rationale

- a. Reduction of solutal convection
- b. Elimination of sedimentation effects

Approach

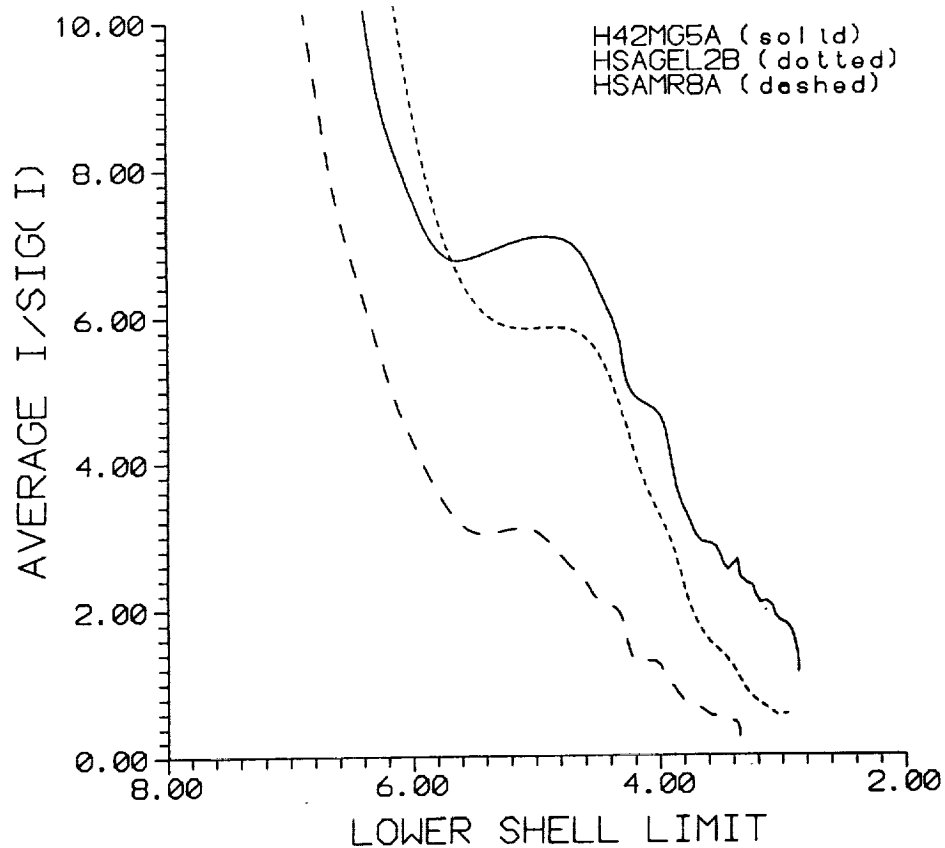
Vapor diffusion/equilibration method - small multiuser
Co-Investigator hardware





BENEFITS/SCIENTIFIC RESULTS

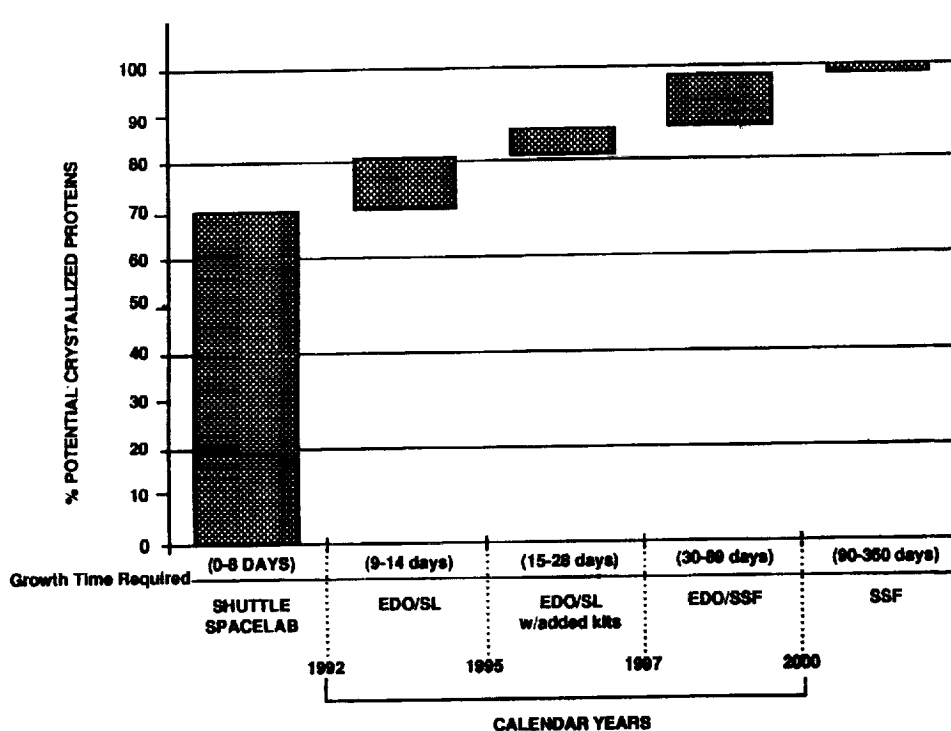
- Several crystal structures have now been refined to significantly higher resolution than previously obtainable by similar ground-based methods.
- Recent success with the longer duration IML-1 mission have produced additional important examples



RELEVANCE TO SPACE STATION

- Protein crystal growth is an experimental science. It will advance at a rate commensurate with number of experiments. Timely human interaction essential to progress
- Many proteins require growth periods from one to several months.

PROTEIN STUDY POTENTIALS vs. MISSION DURATION (1025 CANDIDATE PROTEINS)



PROTEIN CRYSTAL GROWTH SAMPLE OPPORTUNITIES

